

LA-UR-19-22047

Approved for public release; distribution is unlimited.

Title: IC Project Results w17_unedetection -“Simulation of underground nuclear explosions using the combined finite discrete element method” and “Fracture Formation and Permeability Evolution at in situ Pressure, Temperature and Stress Conditions”

Author(s): Euser, Bryan Jeffry
Rougier, Esteban
Knight, Earl E.
Lei, Zhou

Intended for: Report

Issued: 2019-03-07

Disclaimer:

Los Alamos National Laboratory, an affirmative action/equal opportunity employer, is operated by Triad National Security, LLC for the National Nuclear Security Administration of U.S. Department of Energy under contract 89233218CNA000001. By approving this article, the publisher recognizes that the U.S. Government retains nonexclusive, royalty-free license to publish or reproduce the published form of this contribution, or to allow others to do so, for U.S. Government purposes. Los Alamos National Laboratory requests that the publisher identify this article as work performed under the auspices of the U.S. Department of Energy. Los Alamos National Laboratory strongly supports academic freedom and a researcher's right to publish; as an institution, however, the Laboratory does not endorse the viewpoint of a publication or guarantee its technical correctness.



IC Project Results

w17_unedetection - “Simulation of underground nuclear explosions using the combined finite discrete element method” and “Fracture Formation and Permeability Evolution at in situ Pressure, Temperature and Stress Conditions”

Bryan Euser, Esteban Rougier, Earl Knight, Zhou Lei

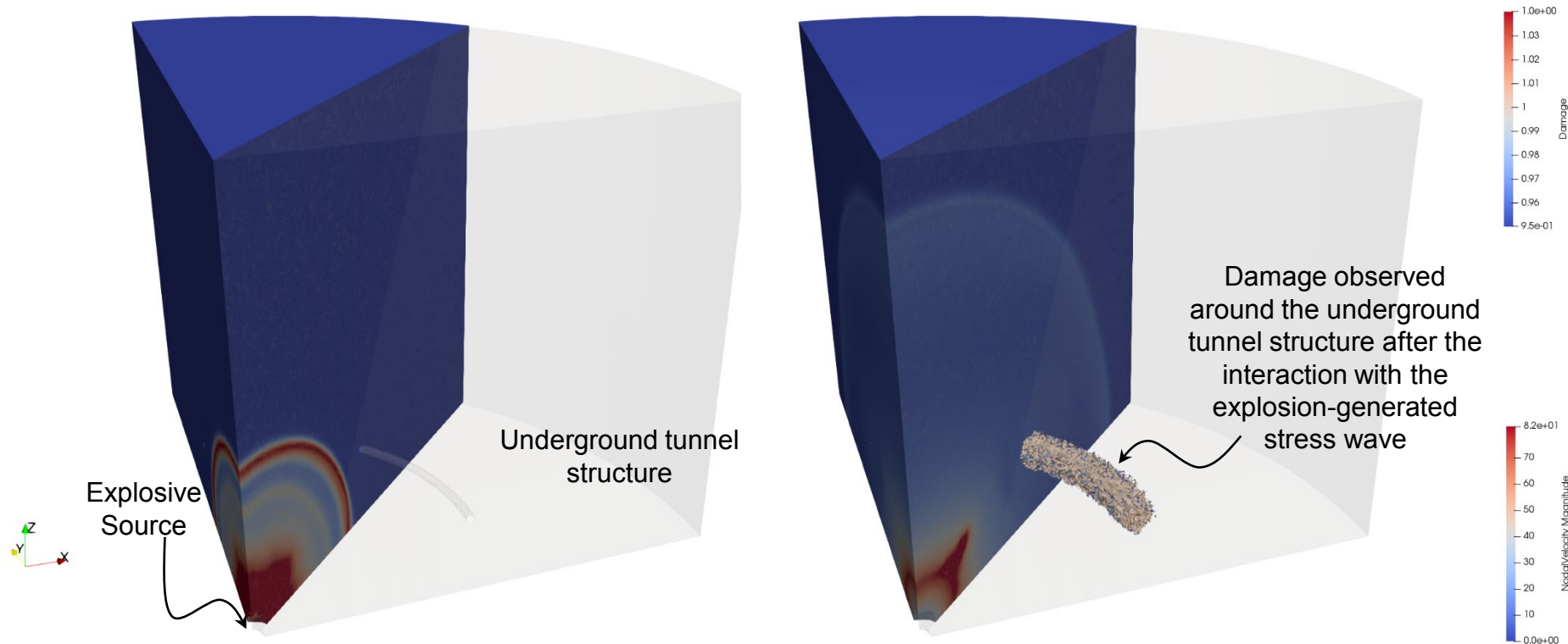
February 26, 2019

UNCLASSIFIED



Hydrodynamic modeling (UNESE)

Large scale simulations are conducted to model the effects of UNE on an underground structure

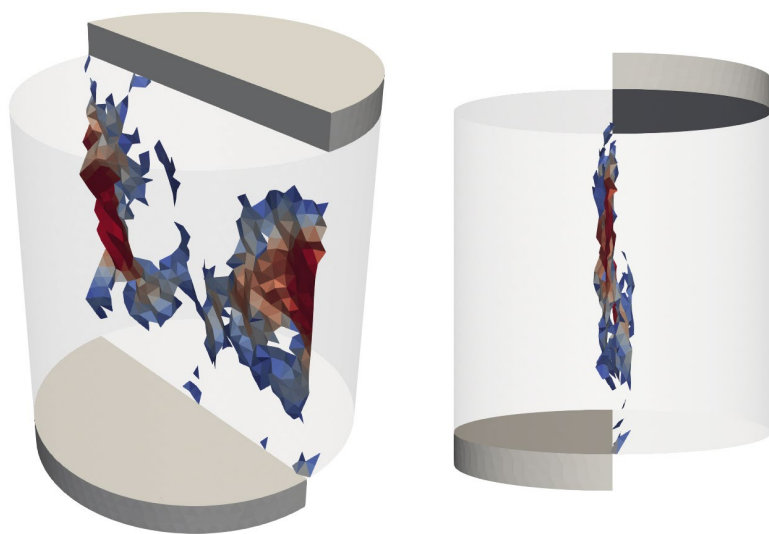


An explosive source for a legacy nuclear test is used as an input in this 3D model to study the consequences of the interaction between the stress waves and pre-existing underground man-made structures. Left: early stages of the wave propagation. Right later stages of the wave propagation where the damage around the underground tunnel structure can be clearly observed.

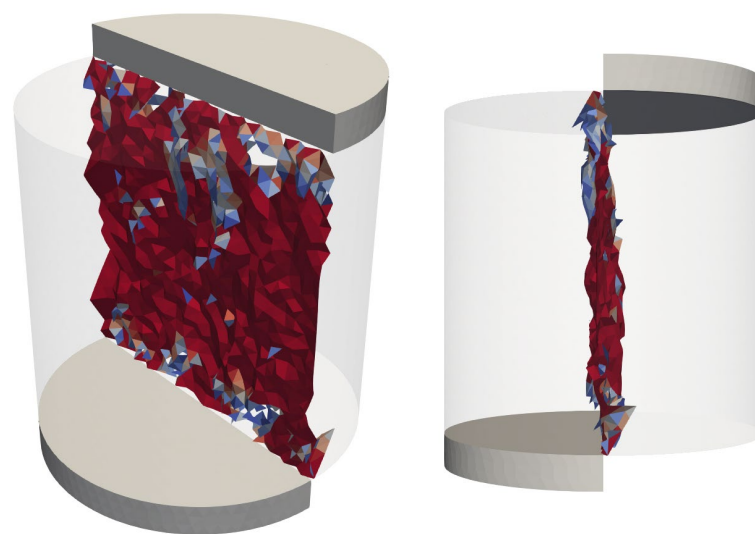
UNCLASSIFIED

Basic Energy Sciences (BES)

Fracture initiation and propagation under triaxial direct-shear loading conditions



Onset of fracturing across the middle plane of the sample. Fractures are initiated from the center of the sample where the maximum principal stresses are positive (tension)



Failure map at the end of the simulation. A very well defined plane of fractures is observed from the simulations.

UNCLASSIFIED